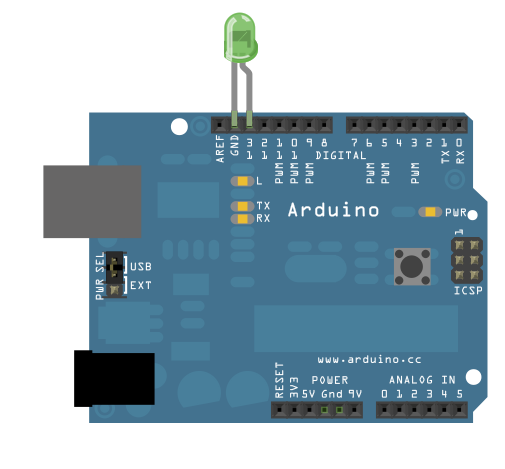
**Lab 2 - Blink**

***This example shows the simplest thing you can do with an Arduino to see physical* output: it blinks an LED. It also proves that you can follow directions and that your Arduino functions properly.**

**Hardware Required**Arduino Board LED

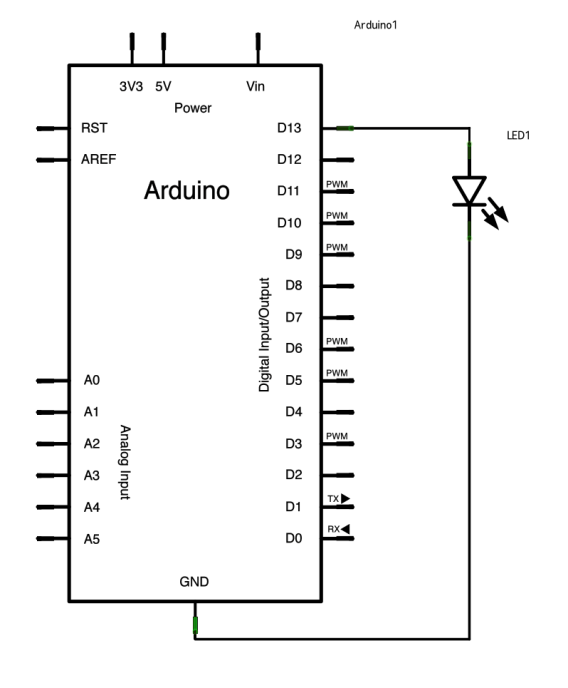
**Circuit**

[](http://arduino.cc/en/uploads/Tutorial/ExampleCircuit_bb.png)To build the circuit, obtain an LED and attach its long, positive leg (called the anode) to pin 13. Attach the short negative leg (called the anode) to ground. Then plug your Arduino board into your computer, start the Arduino program, and continue reading. Most Arduino boards already have an LED attached to pin 13 on the board itself but attach an external one anyway.

**Layout**

If you have experience with electronics, you may notice that the LED doesn't have a resistor in series with it. This is because the amount of current coming from the Arduino’s output pin is low enough that it won't damage the LED. This simplifies the circuit for beginners to delete the resistor. In general practice, though, it's a good idea to add a resistor in series with the LED.

**Basic Code Explanation**

[](http://arduino.cc/en/uploads/Tutorial/ExampleCircuit_sch.png)In the program below, the first thing you do is to “initialize” pin 13 as an output pin with the line   
pinMode(13, OUTPUT);

In the main loop, you turn the LED on with the line:

digitalWrite(13, HIGH);

This supplies 5 volts to pin 13. That creates a voltage difference across the pins of the LED, and lights it up.   
  
Then you turn it off with the line:

digitalWrite(13, LOW);

That takes pin 13 back to 0 volts, and turns the LED off. In between the on and the off, you want enough time for a person to see the change, so the delay() commands tell the Arduino to do nothing for 1000 milliseconds, or one second. When you use the delay() command, nothing else happens for that amount of time. There are ways to create a delay while doing other things.

Copy the code found on page 2 into your software

Sample code

------------------------------------------------------------------

*/\*  
  Blink  
  Turns on an LED on for one second, then off for one second, repeatedly.*

*\*/*  
  
void **setup**() {                  
  *// initialize the digital pin as an output.*  
  *// Pin 13 has an LED connected on most Arduino boards:*  
  pinMode(13, OUTPUT);       
}  
  
void **loop**() {  
  digitalWrite(13, HIGH);   *// set the LED on*  
  delay(1000);              *// wait for a second (1000ms = 1 sec)*  
  digitalWrite(13, LOW);    *// set the LED off*  
  delay(1000);              *// wait for a second*  
}

------------------------------------------------------------------

The colors in your program indicate whether or not you copied the program correctly.  
Once the program works, observe its behavior. Obtain the instructor’s initials here \_\_\_\_

**Program Fundamentals**For more information about the program, go to <http://arduino.cc/en/Tutorial/Sketch> . The site explains the technical details behind the Arduino programming language.

**Modify the Program** (write what happens under each problem)Modify the delay to make the LED blink faster (initials \_\_\_\_\_)

Modify the delay to make the LED blink slower (initials \_\_\_\_\_)

Modify the program; on time, 10ms ; off time, 10ms. Explain what happened. (initials \_\_\_)

Make the LED remain off for longer, but turn on for a short time period. (initials \_\_\_)

Create a program to blink your initials in Morse code. Web search for Morse code. (initials \_\_\_)